

TAXONOMY OF THE *ERIGERON CORONARIUS* GROUP OF *ERIGERON*
SECT. *GENICULACTIS* (ASTERACEAE: ASTEREAEE)

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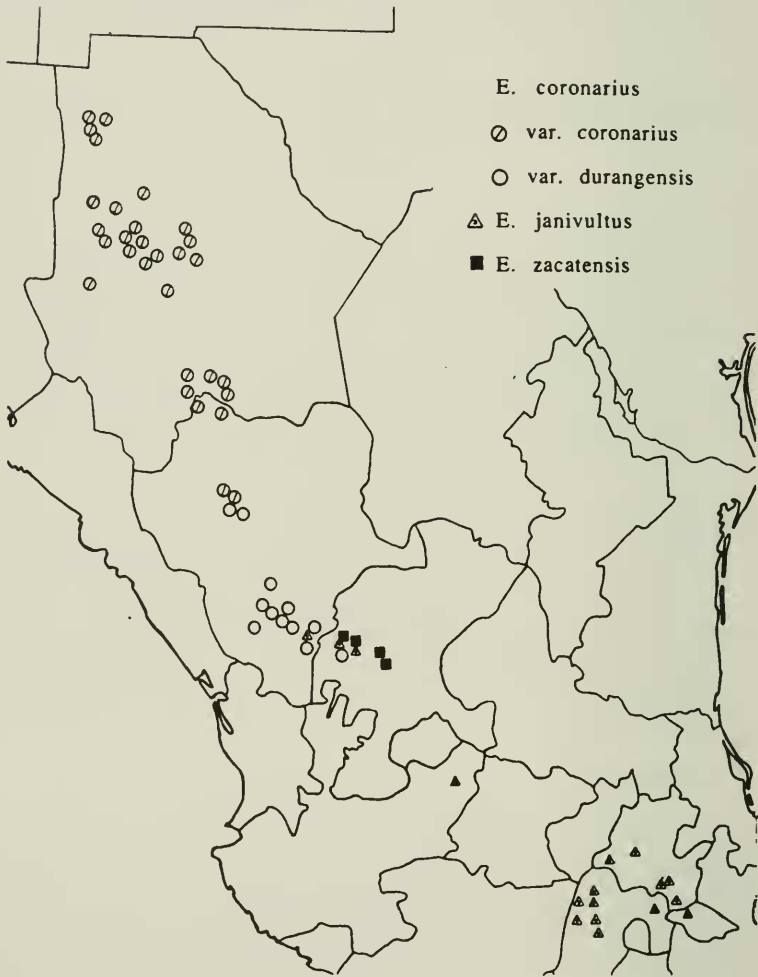
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ABSTRACT

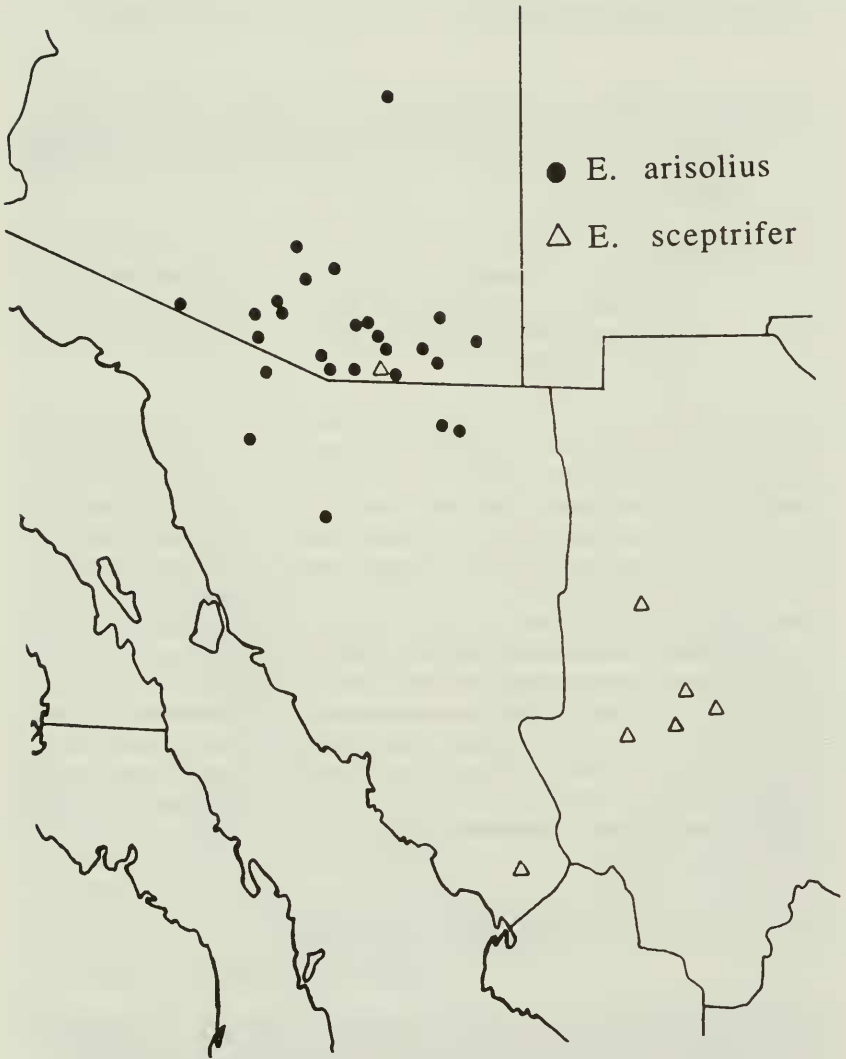
The *Erigeron coronarius* E. Greene group comprises five closely related species, ranging from south central México to the southwestern United States, and characterized by habitats primarily in grasslands, taproots, narrow and essentially entire leaves, erect buds, and narrow, white, reflexing ligules. *Erigeron janivultus* Nesom and *E. coronarius* have relatively wide ranges in México. *Erigeron zacatensis* sp. nov. is a relatively narrow endemic of Zacatecas and is probably derived from *E. coronarius* or *E. janivultus*. *Erigeron arisolius* sp. nov., which occurs in southern Arizona and northern Sonora, is most similar to *E. coronarius*. *Erigeron sceptrifer* sp. nov. occurs in central Chihuahua, adjacent Sonora, and southeastern Arizona and appears to be more distantly related to the other taxa of the group. Four of the taxa are known to exist primarily as diploids, but tetraploids also have been discovered in three of them. In a broader context, the *E. coronarius* group is itself placed within a larger group of species and the whole assemblage is recognized here as a new section, *Erigeron* sect. *Geniculactis*, typified by *E. coronarius*.

KEY WORDS: *Erigeron*, Asteraceae, Astereae, Arizona, México

Erigeron coronarius E. Greene is a relatively common species of grassland habitats and disturbed sites in Chihuahua and Durango, México. In studies of Mexican *Erigeron*, the plants most closely similar to *E. coronarius* have been recognized, including several previously undescribed taxa, two species of which are known from both México and the United States. In the following study, all taxa of the *E. coronarius* group are mapped (Maps 1 and 2) and provided with a formal taxonomic treatment as well as an hypothesis regarding their position within the genus.



Map 1. Geographic distribution of *Erigeron coronarius*, *E. janivultus*, and *E. zacatensis*.



Map 2. Geographic distribution of *Erigeron arisolius* and *E. sceptrifer*.

I. TAXONOMY OF THE *ERIGERON CORONARIUS* GROUP*Erigeron coronarius* E. Greene

Erigeron coronarius E. Greene, Pittonia 2:167. 1891. TYPE: MÉXICO. Chihuahua: Pine plains, base of the Sierra Madre, 2-3 mi S of Guerrero, 27 Sep 1887, C.G. Pringle 1275 (HOLOTYPE: US!; Isotypes: GH!, MEXU!, NY!, PH!).

Erigeron howardii M.E. Jones, Contr. West. Bot. 12:45. 1908. TYPE: MÉXICO. Chihuahua: Colonia Juárez, Sierra Madre Mts., 12 Sep 1903, M.E. Jones s.n. (HOLOTYPE: POM!, US photo!).
Achaetogeron howardii (M.E. Jones) S.F. Blake, Contr. U.S. Natl. Herb. 29:127. 1945.

Annuals to short lived perennials from a taproot. Stems 1-5 dm tall, single or multiple from the base, prominently yellow ribbed, coarsely hispid with thick based, spreading to slightly ascending, well spaced hairs, mostly along the ribs, minutely stipitate glandular. Leaves hispid-strigose, ascending, often strictly so, linear or narrowly oblong to linear lanceolate or linear oblanceolate, entire or sometimes with 1-2 pairs of coarse, rounded lobes, the midcauline 1-3 cm long, 1-2(-3) mm wide, narrowed upwards. Heads hemispheric, 5-6(-7) mm wide, erect in bud, loosely corymboid; phyllaries with thick, raised, dark orange midvein, abaxially and adaxially, hispid with stiffly spreading curved hairs, minutely granular glandular, the inner 2.5-4.0 mm long. Ray flowers ca. 80-200 in 2-3 series, the corollas white, less commonly light lavender or pinkish, 6-7 mm long, with ligules 0.3-0.6 mm wide, reflexing. Disc corollas 1.8-2.5 mm long, swollen just above the tube. Achenes 0.5-0.8 mm long, sparsely strigose to glabrate, with 2 orange nerves; pappus of (0-)4-8 fragile bristles, the outer a hyaline corona with a fimbriate or laciniate apex or sometimes a series of basally fused hyaline scales 0.1-0.3 mm high.

KEY TO THE VARIETIES

1. Plants annual; stem pubescence spreading above and below; phyllaries usually green; pappus of 4-8(-10) bristles, with a corona 0.1-0.2 mm high var. *coronarius*
1. Plants annual to short lived perennial; stem pubescence spreading above, often ascending-appressed below; phyllaries usually purple tipped; pappus of 2-6 bristles, with a corona 0.2-0.3 mm high var. *durangensis*

Erigeron coronarius E. Greene var. *coronarius*

Chihuahua and northern Durango; roadsides, pastures, grasslands, oak or pine woodlands; (1450-)1850-2650 m; June-October. Chromosome numbers, $n=9$, 18.

Representative collections examined: MÉXICO. Chihuahua: Road to Majaico, 9 mi W of Hwy 45 turnoff, *De Jong & Longpre 922* (MU) (voucher for chromosome count of $n=9$, as *E. divergens* Torr. & A. Gray [De Jong & Longpre 1963]); near Balleza, 23 Sep 1898, *Goldman 196* (GH, NY, US); 2.6 mi N of jct of Hwy 16 on road to Barbidos, 4 Aug 1975, *Lewis & Bierner 213* (LL) (voucher for chromosome count of $n=9$ by B.L. Turner [as indicated on sheet], apparently previously unpublished); 8 mi N of Santo Tomas, 21 Sep 1939, *Mueller 3988* (GH, MICH, SMU, TENN); 21 mi ESE of Cuauhtémoc on Hwy 16, 8 Aug 1977, *Nesom 626* (MEXU, TEX) (voucher for chromosome count of $n=9$, reported here); 13 mi W of Cuauhtémoc on Hwy 16, 8 Aug 1977, *Nesom 626* (MEXU, TEX) (voucher for chromosome count of $n=9$, reported here); 13 mi W of Cuauhtémoc on Hwy 16, 8 Aug 1977, *Nesom 627* (MEXU, TEX) voucher for chromosome count of $n=18$, reported here); 15 mi W of Madera on logging road, 9 Aug 1977, *Nesom R636* (MEXU, NCU, TEX) (voucher for chromosome count of $n=9$, reported here); 30 mi SW of Parral on Hwy 24 toward El Vergel, 21 Aug 1981, *Nesom 4462* (MEXU, NMC, NY, TEX); 11 mi N of Madera on Hwy 16 toward Las Varas, 24 Aug 1981, *Nesom 4507* (ANSM, ASU, ARIZ, CAS, CHIDIR, COLO, ENCB, F, GH, GUADA, IBUG, MEXU, MICH, NCU, NMC, OBI, PATZ, RSA, TEX, UC, UCR, UNM, US, WIS); Rosario, E of La Junta, 14-15 Sep 1934, *Pennell 18736* (GH, NY, PH, US); 14 mi SW of Chihuahua City, 29 Aug 1961, *Powell & Edmondson 979* (TEX) (voucher for chromosome count of $n=18$ [Powell & Turner 1963]); Mapula Mts., 11 Nov 1886, *Pringle 897* (MEXU, NY, US); 39 mi W of Cd. Chihuahua on Hwy 16, 20 Aug 1967, *Stuessy 1025* (DUKE, COLO, TEX, UC, WIS) (voucher for chromosome count of $n=9$, as *E. divergens* [Keil & Stuessy 1975]); Cerro del Nido complex, 7.5 mi W of Bella Vista, on Mesa La Boquilla, 15 Jul 1981, *Worthington 7307* (COLO, TEX, UTEP). Durango: 7 mi S of Las Nieves on Hwy 45, 20 Aug 1981, *Nesom 4458* (ARIZ, ASU, ENCB, GH, MEXU, NMC, NY, TEX); 11 km NW of Santiago Papasquiaro, 22 Aug 1983, *Worthington 11251* (TEX); weedy playground in Santiago Papasquiaro, 25 Aug 1983, *Worthington 11461* (TEX).

Erigeron coronarius E. Greene var. *durangensis* Nesom, var. nov. TYPE: MÉXICO. Durango: 25 mi W of Cd. Durango on Hwy 40, 7400 ft, abundant along roadsides, 18 Aug 1981, *G. Nesom 4428* (HOLOTYPE: TEX!; Isotypes: GH!, MEXU!, US!).

Differt a *E. coronario* E. Greene var. *coronario* phyllariorum apicibus purpureis et pappi setis paucioribus atque corona leviter longiore.

Durango and west central Zacatecas; grassy roadsides, disturbed sites, areas of shrublands and juniper to pine-oak woodlands; 2050-2400 m; August-November. Chromosome numbers, $n=9$, 18 pairs.

Representative collections examined: MÉXICO. Durango: 14 mi W of Cd. Durango on Hwy 40, 7 Aug 1961, *DeJong & Longpre 979* (TEX) (voucher for chromosome count of $n=9$ [DeJong & Longpre 1963]); 38 mi W of Cd. Durango on Hwy 40, 8 Aug 1961, *DeJong & Longpre 994* (MEXU, NY, TEX) (voucher for chromosome count of $n=9$ [DeJong & Longpre 1963]); ca. 31 mi SW of Durango, 16 Aug 1960, *King 3746* (MICH, TEX, UC, US) (voucher for chromosome count of $n=9$ by B.L. Turner [as indicated on the sheet], previously unpublished); Tepehuanes, 28 Jul 1944, *Fisher 44261* (GH, SMU); 18 mi WSW of Durango on Hwy 40, 6 Aug 1977, *Nesom 614* (GUADA, MEXU, TEX, WIS) (voucher for chromosome count of $n=9$, reported here); 0.5 mi E of Llano Grande on Hwy 40, 18 Aug 1981, *Nesom 4433* (ENCB, GH, MEXU, TEX); 3.5 mi W of Llano Grande at Las Cumbres on Hwy 40, 19 Aug 1981, *Nesom 4448* (MEXU, TEX); city of Durango and vicinity, Apr-Nov 1896, *Palmer 351* (GH, MO, UC, US); city of Durango and vicinity, Apr-Nov 1896, *Palmer 929* (GH, MO, NY, UC, US); Otinapa, 25 Jul-5 Aug 1906, *Palmer 424* (CM, GH, MO, NY, UC, US); Sandia Station, 16 Oct 1905, *Pringle 13647* (ARIZ, CAS, GH, LL, MICH, SMU, TEX, US); 5 mi W of Durango on Hwy 40, 28 Jun 1974, *Roberts & Keil 10338* (OS) (voucher for chromosome count of $n=9$ [Keil & Stuessy 1977]); 11 km NW of Santiago Papasquiaro, 22 Aug 1983, *Worthington 11213* (TEX). Zacatecas: Ca. 2 mi W of Sombrerete on Hwy 45, 18 Aug 1981, *Nesom 4424a* (TEX).

My conclusions here contrast with those of an earlier, unpublished study (Nesom 1980), where I viewed the plants from the southern half of Durango as most closely related to *Erigeron janivultus* Nesom and referred to them as a variety of the latter species. Both of these taxa might be treated, with some justification, as varieties of *E. coronarius*, particularly since the Durango plants are intermediate in geography between typical *E. coronarius* and *E. janivultus*. However, although they have purplish phyllaries and appressed pubescence (on the lower stems) as in *E. janivultus*, they are more similar to *E. coronarius* in their minutely stipitate glandular upper stems with spreading hairs and their pappus with more numerous bristles and a much shorter corona. Further, there is a much stronger discontinuity in morphology between var. *durangensis* and *E. janivultus* than exists between var. *coronarius* and var. *durangensis*. Plants with distinctly purple tipped phyllaries but 6-8 pappus bristles and short coronas, morphologically intermediate and intergrading between var. *coronarius* and var. *durangensis*, occur from northern Durango into southern Chihuahua (e.g., *Nesom 4462*, *Pringle 13647*, *Worthington 11213*).

Diploids have been reported from both varieties of *Erigeron coronarius* as well as from *E. janivultus*. While diploids appear to be more common, tetraploids also are known from each of these three taxa (see citations and

references in "Representative collections" from this paper, and De Jong & Nesom, in prep.), but within a single taxon, the tetraploids appear to be morphologically indistinguishable from diploids. Only diploids have been reported from *E. arisolius*.

Erigeron arisolius Nesom

Erigeron arisolius Nesom, *sp. nov.* TYPE: UNITED STATES. Arizona: Cochise Co., W side of Chiricahua Mts., Hwy 181, ca. 9.5 mi S of jct with Hwy 186, near Turkey Creek Road, abundant along roadside and in grassy plains, 4800 ft, 28 Aug 1981, *G. Nesom 4521* (HOLOTYPE: TEX!; Isotypes: ARIZ!, ASU!, CAS!, COLO!, ENCB!, GH!, MEXU!, MO!, NMC!, NY!, RM!, UC!, UCR!, UNM!, US!, WIS!).

E. coronario E. Greene similis sed pappo setis (10-)12-17 atque serie exteriore setarum discretarum vel squamellarum anguste lanceolatarum differt.

Annuals to short lived perennials from a taproot. Stems 3-7 dm tall, single or multiple from the base, prominently yellow ribbed, coarsely hispid with thick based, spreading to slightly ascending, well spaced hairs mostly along the ribs, minutely stipitate glandular. Leaves hispid-strigose, ascending, often strictly so, linear or narrowly oblong to linear lanceolate or linear oblanceolate, entire or sometimes with 1-2 pairs of coarse, rounded lobes, the basal and lower cauline 2.5-5.0 cm long, 2-5 mm wide, narrowed upwards. Heads hemispheric, 5-8 mm wide, erect in bud, in loose corymbs; phyllaries with a thick, raised, dark orange midvein, abaxially and adaxially, hispid with stiffly spreading curved hairs, minutely granular glandular, narrowly lanceolate, nearly equal in length, 2.5-3.5 mm long. Ray flowers 125-180 in 2-3 series, the corollas white, less commonly light lavender or pinkish, 6-7 mm long, with ligules 0.6-1.0 mm wide, reflexing. Disc corollas 2.0-2.5 mm long, glabrous, swollen just above the tube. Achenes 0.7-1.0 mm long, sparsely strigose to glabrate, with 2 orange nerves; pappus of (10-)12-16 fragile bristles, with an outer series of separate setae or lanceolate scales 0.1-0.3 mm high. Chromosome number, $n=9$ pairs.

Arizona (Apache, Cochise, Pima, and Santa Cruz counties), Sonora; grasslands, often in moist areas, sometimes with mesquite, areas of oak woodlands in grassy openings or roadsides; (700-)1300-1650 m; May-October(-November).

Representative collections examined. MÉXICO. Sonora: Mpio. Altar, Rancho "La Discordia," 24 Aug 1969, *Araiza Q. 62* (ENCB); Fronteras, 25 Sep 1890, *Hartman 54* (GH, US); S-gogogsig village, SW of Baboquivaris,

floodwater field, 14 Aug 1980, *Nabham & Bahre 312* (ARIZ); 6 mi E of Fronteras on Fronteras-Nacozari hwy, Angostura Dam Road, 22 Aug 1981, *Roth s.n.* (TEX); Rancho Carrizo, 103 mi S of Nogales and 3 mi W of Hwy 15, 30 Aug 1967, *Tomelson s.n.* (ARIZ).

UNITED STATES. Arizona. Apache County: 27 mi W of Carrizo, 12 Jun 1937, *Peebles 19579* (ARIZ). Cochise County: Mule Mts., 25 Sep 1931, *Harrison 8242* (ARIZ, TEX, US); Chiricahua Mts., W Turkey Creek at Rock Creek Road, 28 Jul 1981, *Luetke s.n.* (TEX); Mexican boundary line, S of Bisbee, 14 Sep 1892, *Mearns 903* (US); W side of Chiricahua Mts., Pinery Creek Road, 4 mi SE of jct with road to Chiricahua Natl. Monument, 28 Aug 1981, *Nesom 4519* (ARIZ, ASU, GH, MEXU, NMC, NY, TEX, UNM, US); Huachuca Mts., 0.6 mi W of Hwy 92 on Ash Canyon Road, 30 Aug 1984, *Sanders 5138* (ARIZ, TEX); Parker Canyon Lake, Canelo Hills, 7 Jul 1985, *Sanders 5923* (TEX); Dragoon Mts., Sep 1930, *Thorner s.n.* (ARIZ). Pima County: Within city of Tucson, 2 Sep 1980, *Adams 271* (LL); Robles to San Fernando, 21 Aug 1932, *Harrison & Kearney 8941* (ARIZ, TEX, US); 10 mi N of San Miguel, Papago Indian Reserv. near international boundary, 16 Aug 1931, *Harrison & Kearney 8029* (ARIZ, TEX); ca. 2 mi W of Roble Jct along Ariz Rte 86, 18 Oct 1975, *Keil 11146A* (ASU); (voucher for chromosome count of $n=9$ pairs, reported as *E. divergens* [Keil & Pinkava 1976]); ca. 2 mi W of Roble Jct along Ariz Rte 86, 18 Oct 1975, *Keil 11158* (ASU) (voucher for chromosome count of $n=9$ pairs, reported as *E. divergens* [Keil & Pinkava 1976]); just off Hwy I-19 on Papago Rd exit, 6 Sep 1975, *Keil 11089A* (ASU) (voucher for chromosome count of $n=9$ pairs, reported as *E. divergens* [Keil & Pinkava 1976]); Santa Rita Mts., Box Canyon Road, 3.2 mi W of Hwy 83, 30 Aug 1985, *McLaughlin 3035* (ARIZ); mouth of Baboquivari Canyon, 15 Aug 1926, *Peebles, et al. 2788* (ARIZ, TEX); Santa Catalina, 1 May 1894, *Tourney s.n.* (GH). Santa Cruz County: Between Pena Blanca and Ruby, 2.4 mi W of road to Sycamore Canyon, 9 Sep 1976, *McGill & Lehto L20432* (ASU, TEX); NW of Sonoita, 3.7 on road toward Gardner Canyon from Hwy 83, 14 Aug 1982, *Sundberg 1595* (TEX) (voucher for chromosome count of $n=9$ pairs by S. Sundberg [as indicated on sheet], apparently previously unpublished); Pajarito Mts., Sycamore Canyon, 17 Aug 1976, *Van Devender & McCarten s.n.* (ARIZ).

Erigeron arisolius in Arizona has been identified as *E. divergens* Torr. & A. Gray, although a number of sheets have annotations noting that the plants are not typical of the latter. In spite of the morphological similarity between the two, *E. divergens* belongs to a different section of the genus (sect. *Olygotrichium* (see Nesom 1989), and there is no evidence of any form of gene flow between them. They are particularly distinct in the field, where the erect buds and reflexing rays of *E. arisolius* can be contrasted with the nodding buds and straight rays of *E. divergens*. The following couplet summarizes differences between them.

1. Stems with coarse, thick based hairs arising mostly from the cauline ribs, minutely but prominently stipitate glandular; buds erect; rays reflexing; achenes with orange nerves; pappus bristles 10-16 *E. arisolius*
1. Stems with relatively thin based hairs arising evenly from the ribs and interstices, sometimes minutely granular glandular, rarely stipitate glandular near the heads; buds nodding; rays straight or closing upwards; achenes with whitish nerves; pappus bristles 7-10 *E. divergens*

Erigeron arisolius is most similar to *E. coronarius*. Although the two species are similar in habit and most morphological features, they have entirely separate geographic ranges and I have seen no specimens that could be regarded as intermediate. They are distinguished by the contrasts in the following couplet, most sharply by features of the pappus.

1. Plants 3-7 dm tall; largest leaves 2.5-5.0 cm long, 2-5 mm wide; rays with ligules 0.6-1.0 mm wide; achenes 0.7-1.0 mm long; pappus of (10-)12-17 bristles, with an outer series of separate setae or narrowly lanceolate squamellae *E. arisolius*
1. Plants 1-5 dm tall; largest leaves 1-3 cm long and 1-2(-3) mm wide; rays with ligules 0.3-0.6 mm wide; achenes 0.5-0.8 mm long; pappus of (2-) 4-8(-10) bristles, with an outer, hyaline corona of broad, basally fused squamellae *E. coronarius*

Although *Erigeron arisolius* is a discrete taxon, not intergrading with others of the *E. coronarius* group, it may be viewed as the northern extreme in a north/south trend of variation in several morphological characters, from *E. arisolius* to *E. coronarius* var. *coronarius*, to var. *durangensis*, and finally to *E. janivultus*, the southern extreme. From north to south, the plants of this assemblage generally become shorter in stature, longer lived, fewer headed, and the pappus bristles are reduced in number and the corona increased in height.

Erigeron janivultus Nesom

Erigeron janivultus Nesom (*nom. nov.*), Sida 9:223. 1982. Based on: *Erigeron linearifolius* S. Wats., Proc. Amer. Acad. Arts 26:139. 1891. TYPE: MÉXICO. México: Bluffs and plains near Flor de María, 4 Sep 1890, C.G. Pringle 3242 (HOLOTYPE: GH!; Isotypes: CM!, ENCB!, MEXU-2 sheets!, MSC!, NY!, PH!, UC-2 sheets!, US-2 sheets!). Not *Erigeron linearifolius* Cav., 1801.

Achaetogeron ascendens Greenm., Proc. Amer. Acad. Arts 41:254. 1905.

TYPE: MÉXICO. Hidalgo: Meadows near Buena Vista Station (Cuyamaloya), 4 Aug 1904, *C.G. Pringle 8851* (HOLOTYPE: GH!; Isotypes: CM!, ENCB!, MEXU-2 sheets!, NMC!, NY!, PH!, UC!, US-2 sheets!). Not *Erigeron adscendens* Turcz., 1851.

Short lived perennial herbs from a taproot, often with a short, woody caudex with slender branches. Stems 4-33 cm tall, sparsely but consistently strigose, sometimes minutely stipitate glandular just below the heads. Leaves strigose with appressed-ascending trichomes, minutely stipitate glandular, the basal usually absent by flowering, the cauline linear to linear lanceolate, sessile, mostly 5-30 mm long, 0.5-3.0 mm wide, even sized upwards, the margins entire or with 1-2 pairs of narrow, lateral lobes. Heads hemispheric, 5-9 mm wide, in a loose corymb on peduncles 3-28 mm long; phyllaries in 3-4 series of nearly equal length, the longest 4-5 mm long, mostly narrowly lanceolate, usually purple tipped or purple over the whole surface, hirsute-strigose, minutely stipitate glandular, remaining erect after maturation and release of the achenes. Ray flowers ca. 80-200 in 2-3 series, the corollas drying white or lavender tinged, 6-9 mm long, the ligules 0.7-0.9 mm wide, reflexing at maturity. Disc corollas 2-4 mm long, the lower limb somewhat inflated and indurated; collecting appendages of the style branches triangular to shallowly deltate. Achenes (0.8-)1.0-1.5 mm long, with 2(-3) thickened ribs, sparsely strigose; pappus of ray and disc a conspicuous hyaline corona with a fimbriate or laciniate apex 0.3-0.7 mm high, the inner series of 0-5 bristles 1/2-3/4 as long as the disc corollas. Chromosome numbers, $n=9$, 18 pairs.

Durango, Zacatecas, Jalisco, Hidalgo, México, Tlaxcala; roadsides, grasslands, openings in oak woods; 1850-2800 m; June-October.

Representative collections examined: MÉXICO. Hidalgo: 10 km W of Alfajayucan, 16 Jul 1965, *Gonzalez Q. 2702* (ENCB); toward Singuilucan, 2 mi S of jct with Hwy 130 at Cuyamaloya, 9 Aug 1981, *Nesom 4382* (ENCB, GH, MEXU, RM, TEX); Marques Station, 26 Aug 1905, *Pringle 13534* (ARIZ, MICH, MSC, NMC, SMU); 1 km S of Guajolote, near Epazoyucan, 22 Jul 1979, *Rzedowski 36242* (ENCB); 12 km E of Apam, 27 Jun 1966, *West FF10* (MICH, WIS). Jalisco: ca. 11 mi SE of Lagos de Moreno, 7 Sep 1952, *McVaugh 12815* (MICH). México: 5 km N of Atlacomulco, 28 Jun 1960, *Beaman 3370* (TEX) (voucher for chromosome count of $n=9$, as *E. coronarius* [Beaman & Turner 1962]); 9 mi E of Villa Victoria on Hwy 15, 29 Jul 1965, *Kral 25156* (ENCB); 11 km NNW of Ixtlahuaca on Hwy 55, 16 Aug 1981, *Nesom 4412* (ASU, ARIZ, CHDIR, COLO, GH, GUADA, MEXU, MO, NMC, NY, RM, TEX, US, WIS); 1.5 km N of Atlacomulco, 16 Aug 1981, *Nesom 4420* (MEXU, TEX); Flor de María, 10 Sep 1892, *Pringle 7368* (NY, POM); 20 km NE of Texcoco, 23 Jun 1966, *Rzedowski 22462* (ENCB, MICH, MSC); 6 mi S of Acambay, 7 Nov 1970, *Webster & Breckon 16246* (MICH). Tlaxcala: NW of

Cauhula, W of San Antonio Calpulalpan, 8 Oct 1967, *Villegas 676* (ENCB). Zacatecas: ca. 2 mi ESE of Sombrerete on Hwy 45, 5 Aug 1977, *Nesom R611* (CIIDIR, GH, MEXU, MICH, NY, TEX, US); ca. 2 mi W of Sombrerete on Hwy 45, 18 Aug 1981, *Nesom 4424b* (CIIDIR, MEXU, MICH, NY, TEX).

Erigeron janivultus is distinguished from *E. coronarius* by its longer duration, lignescent, branching caudex, basally ascending stems, strigose stem pubescence, eglandular upper stems and phyllaries, and thicker ribbed, longer achenes with a longer coroniform pappus and fewer bristles.

Two collections from the vicinity of Sombrerete in west central Zacatecas (*Nesom 611* and *4424b*) are intermediate in some respects between *E. janivultus* and *E. coronarius*. Although I have identified them as the former, emphasizing their eglandular stems with appressed pubescence, they are similar to *E. coronarius* in their short disc corollas and pappus with a short (0.2-0.3 mm) corona and relatively numerous (5-8) bristles. In fact, further collections in this region might furnish evidence that the two taxa are best considered conspecific, even though they are very different at their geographic extremities. Earlier, Blake (1945) also recognized the close relationship between *E. coronarius* and *E. janivultus* and accurately described essential differences between them. At the collection site for *Nesom 4424b*, relatively typical *E. coronarius* was also collected (*Nesom 4424a*) as well as the discoid taxon referred to below as *E. zacatensis* (which see for additional comments).

***Erigeron zacatensis* Nesom, sp. nov.** TYPE: MÉXICO. Zacatecas: ca. 2 mi W of Sombrerete on Hwy 45, at crest of hill overlooking town, grazed area with scattered, low Fabaceous shrubs and *Opuntia*, very scattered, 8200 ft, 18 Aug 1981, *G. Nesom 4423* (HOLOTYPE: TEX!; Isotypes: IBUG!, CIIDIR!, ENCB!, GH!, MEXU!, MICH!, NY!, US!).

Differt a *E. janivulto* Nesom ligulis multum redactis et pappi setis numerosioribus atque corona brevior.

Annual to short lived perennial herbs from a taproot, often with a short, woody caudex with slender branches. Stems 10-20 cm tall, erect to basally ascending, few branched at about the middle, sparsely pubescent with appressed to spreading ascending hairs, eglandular. Leaves strigose with appressed-ascending trichomes, eglandular, the basal usually absent by flowering, the cauline linear to linear lanceolate, sessile, mostly 5-30 mm long, 0.5-2.0 mm wide, even sized upwards, the margins entire. Heads hemispheric, 8-11 mm wide, in a loose corymb on peduncles mostly 2-6 cm long; phyllaries in 3-4 series of nearly equal length, the longest 2.5-4.0 mm long, mostly narrowly lanceolate, usually purple tipped, hirsute strigose, minutely granular glandular, spreading after maturation and release of the achenes, but not reflexing. Ray flowers ca. 150-250 in 2-3 series, fertile, the ligules 0.1-0.2 mm wide, 0.5-1.0 mm long, not extending past the phyllaries. Disc corollas 2.2-2.8 mm long,

the lower limb somewhat inflated and indurated; collecting appendages of the style branches triangular to shallowly deltate. Achenes 0.5-0.8 mm long, with 2(-3) thickened, whitish ribs, sparsely short strigose; pappus of ray and disc a conspicuous hyaline corona with a fimbriate or lacinate apex 0.2-0.3 mm high, the inner series of 5-10 bristles $3/4$ as long as the disc corollas.

Zacatecas; shrublands, grasslands; 2150-2500 m; August-October.

Additional collections examined: MÉXICO. Zacatecas: ca. 20 mi NW of Fresnillo on Hwy 45, *Davidse 10005* (MO); 8 mi NW of jct in Hwys 45 and 49 on Hwy 49, 29 Jun 1972, *Denton 1721* (ENCB, MICH); Hwy 45, 1 km E of turnoff to Est. Frio, 23 Aug 1979, *Lane 2704* (TEX); between Fresnillo and Sombrerete on Hwy 45, 6.0 mi W of turnoff to Santa Rosa, 28 Sep 1984, *Sundberg 2914* (MEXU, TEX).

In their relatively short disc corollas and pappus of a short corona with 5-10 bristles, these plants are similar to *Erigeron coronarius*, but in their eglandular stems with appressed-ascending hairs, they are more similar to *E. janivultus*, particularly those plants so identified from Zacatecas. *Erigeron zacatensis* differs from both taxa in the greatly reduced ligules that barely extend past the involucre bracts, although it may be a derivative of one or the other or both (as a hybrid) of them. Nearly identical plants have been collected at several separate, relatively closely situated localities in west central Zacatecas (Map 1), apparently indicating that the taxon is stabilized and reproducing. Plants of both *E. coronarius* and *E. janivultus* also were growing at the type locality of *E. zacatensis* (see comments following *E. janivultus*).

***Erigeron sceptrifer* Nesom, sp. nov.** TYPE: MÉXICO. Chihuahua: Mpio. Cuauhtémoc, 17.6 km W of Cuauhtémoc on Hwy 16, abundant along grassy roadsides, area of pine-oak-juniper, 23 Aug 1981, *G. Nesom 4477* (HOLOTYPE: TEX!; Isotypes: ANSM!, ARIZ!, ASU!, CAS!, CHAPA!, CHDIR!, COLO!, ENCB!, F!, GH!, GUADA!, IBUG!, MEXU!, MICH!, MO!, NMC!, NY!, OS!, RM!, RSA!, WIS!, UC!, UCR!, US!).

E. coronario E. Greene similis sed corollis radii brevioribus et pappo setarum numerosioribus sine corona exteriori imprimis difert.

Plants annual from a slender taproot. Stems 3-8 dm tall, single from the base or more commonly with numerous, ascending branches from the base, moderately pubescent with ascending to spreading hairs arising primarily from the prominent ridges, minutely granular glandular to essentially eglandular. Leaves entire, linear to linear oblanceolate, 1-3 cm long, 0.5-1.5 mm wide (the lowermost sometimes up to 4.0 mm wide and with 1-2 pairs of teeth), minutely granular glandular above and below, moderately pubescent with ascending hairs, these commonly thicker based and more dense on the midrib and

marginal areas. Heads hemispheric, 4-6 mm wide, on short peduncles, numerous in corymboid panicles; phyllaries linear lanceolate, in 3-4 weakly graduated series, the inner 3.0-3.5 mm long, very sparsely hirsute strigose, eglandular or the outer sparsely and minutely granular glandular; receptacles shallow convex. Ray flowers (60-)85-130(-195), 3.8-5.0 mm long, the ligules 0.2-0.4 mm wide, white, drying pink to blue or purple. Disc corollas 1.8-2.3 mm long, with the lower limb somewhat indurate inflated; collecting appendages of the style branches deltate, 0.1 mm long. Achenes 0.6-0.7 mm long, compressed, with 2 orange nerves; pappus of 9-14 fragile bristles slightly shorter than the disc corollas, with a few outer setae or lanceolate scales 0.1-0.2 mm long.

Chihuahua, Sonora, southeastern Arizona; grasslands, with scattered juniper, oak, or oak-pine; 1900-2100 m; July-October.

Additional collections examined: MÉXICO. Chihuahua: 15.6 mi S of Zaragoza, road from Cuauhtémoc to Buenaventura, 4 Aug 1975, *Lewis & Bierner 216* (LL); Hwy 16, 1.5 mi E of jct at La Junta with road toward Creel, 23 Aug 1981, *Nesom 4483* (ANSM, ARIZ, ASU, CAS, CIIDIR, COLO, ENCB, GH, GUADA, MEXU, MICH, NMC, NY, RM, RSA, TEX, WIS, UCR, US); 7.5 mi SW of La Junta (Hwy 16 jct) on road toward Tomochic, 24 Aug 1981, *Nesom 4494* (ARIZ, ENCB, MEXU, TEX); 2 mi W of Matachic on Hwy 16, 24 Aug 1981, *Nesom 4497* (ASU, CIIDIR, MEXU, TEX); 9 mi W of Guerrero on Hwy 16, 24 Aug 1981, *Nesom 4495* (ARIZ, ASU, CHAPA, CIIDIR, ENCB, GH, MEXU, NMC, NY, TEX, US). Sonora: Dist. Alamos, lower part of Estrella Canyon, 31 Oct 1933, *Gentry 722* (DS).

UNITED STATES. Arizona: Cochise Co., Parker Canyon Lake, 12 Oct 1968, *Pinkava, et al. 14609* (ASU, NCU).

Erigeron sceptrifer Nesom is recognized by its annual duration, spreading-ascending stem pubescence, linear leaves, erect buds, numerous, very small heads with short rays that become purplish upon maturity or drying, small, orange-ribbed achenes, and its pappus of 9-14 fragile bristles, without an outer corona. The rays reflex at maturity, although they tend to be more curved reflexed than distinctly bent at the tube/ligule junction, as are the other species closely related to it. It is tentatively included here, but the ligules also have a slight tendency to turn upwards at night, a behavior that is anomalous among the species of the *E. coronarius* group. At two of its collection sites in Chihuahua, *E. sceptrifer* was growing intermixed with *E. coronarius*, which was the more abundant, but there were no plants with any degree of intermediacy between the two.

ARTIFICIAL KEY TO SPECIES OF THE *ERIGERON CORONARIUS*
GROUP

1. Ray corollas not extending past involucre bracts, the heads appearing essentially discoid *E. zacatensis*
- 1' Ray corollas prominent, extending well past the involucre bracts (2)
 2. Ray corollas 3.8-5.0 mm long; pappus of 9-14 bristles, with an outer series of separate bristles or scales *E. sceptrifer*
 - 2' Ray corollas 6-9 mm long; pappus of 0-17 bristles, with an outer corona or series of separate bristles or scales (3)
3. Pappus of (10-)12-17 bristles, with an outer series of separate setae or narrowly lanceolate squamellae *E. arisolius*
- 3' Pappus of 0-8 bristles, with an outer series fused into a definite, complete or nearly complete corona (4)
 4. Stems with appressed to appressed-ascending hairs; stems, leaves, and phyllaries eglandular; pappus with 0-5 bristles; disc corollas 2-4 mm long *E. janivultus*
 - 4' Stems with spreading to spreading ascending hairs, at least on the upper portions of the stems; upper stems, leaves and phyllaries glandular; pappus with (2)4-10 bristles; disc corollas 1.6-2.5 mm long *E. coronarius*

II. A NEW SECTION OF *ERIGERON*, INCLUDING THE *E. CORONARIUS* GROUP

Erigeron coronarius and its close relatives were tentatively positioned near the "*E. pumilus* group" of sect. *Asteroidea*, primarily based on their essentially entire leaves, erect buds, white, reflexing ligules, and basally persistent pappus bristles (Nesom 1989). The similarities among these taxa strongly suggest that the whole group is monophyletic, and I recognize it as a separate section. Distinctions among its taxa restricted to the United States were outlined in an earlier paper (Nesom 1983).

Erigeron sect. *Geniculactis* Nesom, *sect. nov.* TYPE SPECIES: *Erigeron coronarius* E. Greene.

Erigeron (sp. group) *Pumili* Rydb., *Fl. Colorado* 359. 1906, in *clave*.
TYPE SPECIES: *Erigeron pumilus* Nutt., *Gen. N. Amer. Pl.* 2:147.
1818.

Habitationibus gramineis, radicibus palaribus, foliis angustis admodum integrisque, gemmis erectis, flosculis radii numerosis ligulis albis reflexis, pappo setis basaliter persistentibus et serie externa saepe valde evolutis dignoscenda.

Species included: *Erigeron aphanactis* (A. Gray) E. Greene, *E. arisolius* Nesom, *E. clokeyi* Cronq., *E. concinnus* (Hook. & Arn.) Torr. & A. Gray, *E. coronarius* E. Greene, *E. engelmannii* A. Nels., *E. goodrichii* Welsh, *E. janivultus* Nesom, *E. pumilus* Nutt., *E. sceptrifer* Nesom, and *E. zacatensis* Nesom.

The plants of sect. *Geniculactis* are distinguished by their grassland habitats, taproots, narrow and essentially entire leaves, erect buds, numerous ray flowers with white, reflexing ligules, disc corollas with swollen, white indurated throats, and pappus with relatively few, basally persistent bristles and a tendency to produce a strongly elaborated outer series. In contrast to the taxa occurring primarily in México (the "*Erigeron coronarius* group"), which tend to produce numerous heads in paniculate cymes and achenes mostly 0.6-1.0(-1.5) mm long, those species restricted to the United States (the "*E. pumilus* group") tend to produce solitary heads on monocephalous stems and achenes 1.6-2.2 mm long.

While it is almost certain that these two groups represent separate evolutionary lineages, several parallel developments between their respective species are notable. The pappus of *Erigeron concinnus* is a highly elaborated whorl of broad, sometimes basally united scales, very similar to the outer pappus of *E. coronarius*. Further, the ligules of the pistillate flowers of *E. aphanactis* vary from completely absent to filiform projections ca. 1 mm long, matching those found in *E. zacatensis*.

Elsewhere in *Erigeron*, outside of sect. *Geniculactis*, reflexing ligules are known with certainty only in sect. *Scopulincola* (Nesom 1989b, 1990), which is distinguished by its cliffside habitats, obovate leaves, erect buds, and relatively few ray flowers with broad ligules, and in sect. *Polyactis* (Nesom 1989a), which is distinguished by its pinnatifid or coarsely toothed leaves, arching-pendant buds, and basally caducous pappus bristles or lack of bristles. As noted earlier (Nesom 1989b), two monocephalous species of the *E. caespitosus* Nutt. group of sect. *Asteroidea* also appear to have reflexing rays and need to be investigated in more detail for the possibility of a close relationship with the *E. pumilus* group of sect. *Geniculactis*.

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